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ABSTRACT

This paper presents the research and development of knowledge management system for Internet based intellectual assets to leverage the learning process for individual learners. The literature review reveals that corporate solutions of knowledge management are not directly applicable due to the lack of adaptivity needed to provide individualized feedback to the learner, and their localized nature does not directly deal with authentication and verification of distributed information. Architecture has therefore been formulated for the knowledge management system that specifically supports Web-based learning. (Author)

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TO THE EDUCATIONAL RESOURCES INFORMATION CENTER (ERIC)

Internet based learning and Knowledge Management

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Abstract: This paper presents the research and development of knowledge management system for Internet based intellectual assets to leverage the learning process for individual learners. The literature review reveals that corporate solutions of knowledge management are not directly applicable due to the lack of adaptivity needed to provide individualized feedback to the learner, and their localized nature that does not directly deal with authentication and verification of distributed information. Architecture has therefore been formulated for the knowledge management system that specifically supports web-based learning.

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1. Introduction

Strategic concern for survival in the global information technology and information systems disciplines calls for constant upgrade of knowledge especially in computing related areas. The primary reason for this is the ever-changing technology, which compels employees to be up-to-date in their knowledge. The trend of increasing Internet based learning is evident from the increasing number of universities providing facilities to finish degrees and diplomas through Internet. In many instances it becomes pertinent, as otherwise it would mean loss of job. The implication is working population trying to upgrade their knowledge through Internet based learning.

2. Problems with the existing online education systems

Online education systems provide a great solution for working community. But they do not come with unmixed blessing. One of the primary considerations or constraint for both student and teachers is the time element. This necessitates a means by which the accurate and relevant knowledge can be accessed efficiently by the students without wasting much time. On the other hand, teachers should be able to save their precious time by reusability of knowledge. This warrants the use of a knowledge management system.

In a large distant learning class, it is very often not possible to answer individual queries due to low students to teacher ratio. It also lacks some important benefits of traditional classroom setting such as instructor-student and student-student interaction, collaborative work among peers, and so on. Although these factors can be translated into the Internet based learning by use of newsgroups or mailing lists and use of collaborative technology such as discussion forums, but there are several limitations. The first problem is the hesitation within students to post questions in a public arena such as discussion forum. Instead, they tend to post their queries to individual instructors asking for individual attention. The second problem is the information overload in the collaborative environment over time, and it becomes extremely difficult to mine the knowledge. The information exchange in such environments takes place in a haphazard manner due to different temporal and spatial conditions of individual students. This results in non-synchronization and repetition of information leading to even more tedious process of knowledge mining.

Another inherent problem for students who wants to have an in-depth knowledge on any subject through Internet is the overwhelming amount of information available on the Internet from all over the world. To quote Koniger (Koniger et al., 1995) in the article on "Drowning in information but thirsty for knowledge", "*Information is only valuable to the extent that it is structured. Because of a lack of structure in the creation, distribution and reception, information often does not arrive where it is needed and therefore, useless*". This disconcert becomes a serious barrier to potential learners. There are no formal mechanisms available to filter the information for the quality and authenticity verification. Added to this is that the information is not adapted to individual learners and therefore learning does not take any consideration of individual student attributes.

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Another problem associated with gathering knowledge from the Internet is that the available information is not structured and not available in a uniform format. In other words, the available information is in heterogeneous formats varying even within a single source. This makes it extremely difficult to search and retrieve the information, posing one of the biggest challenges in making flexible and robust knowledge management systems.

3. Solution

In this background, the use of knowledge management in Internet based learning can provide an efficient solution for learners. The benefits of using knowledge management system in internet based learning would include increased efficiency in knowledge solicitation, avoid wasting time on repetitive queries, better use of resources etc.

In the following section we will look at the applicability of knowledge management systems to Internet based learning. The next section will look at the methodology to integrate knowledge management and Internet based systems to alleviate the problems common to Internet based learning. This is aimed to cater for both basic and advanced learners. The following section will look at the prototype showing various processes involved in the system. The next section will look at the benefits of the prototype system, followed by the conclusion.

4. Link between Internet based learning and knowledge management

The central theme of knowledge management perceived by many experts in the field is that it is an integrated and systematic process of acquiring, eliciting, organizing, representing and retrieval of information asset. The objective of the knowledge management in Internet based learning is to generate value in terms of knowledge from intelligent capital to enable faster and efficient learning. According to Liebowitz (1999), knowledge management deals with the conceptualization, review, consolidation, and action phase. Knowledge management in Internet based learning is about connecting learners with learners, and teachers and learners with information and knowledge (Corrall, 1999). It is about getting the right knowledge to the right person at the right time.

The phenomenon of overload of information to learners results in the learners' inability to cope with the processing of increased amount of available information. Internet based knowledge management systems can prove to be efficient solution to manage the problems associated with Internet based learning. They can improve the productivity through achieving reusability and enhancing educational services to the learners. Also, immediate clarification of doubts of the learners through on-line knowledge management system can enable them to correct the mistakes without waiting for the teachers or tutors to respond to learners. Features specific to learning institutions are knowledge intensive nature and extensive reusability of learning materials. These reasons call for the use of knowledge management system in learning. Synergy of Internet based learning and knowledge management systems would be ideal for saving time, avoiding reinventing wheel, increasing efficiency and so on.

5. Methodology

This paper proposes the use of knowledge management systems for both basic and advance learners. Basic learners are those who would like to just finish the course without any reference to any additional material. The advance learners are those who would like to enhance their knowledge in a given area beyond the requirements of the course curriculum.

Part 1: Catering for basic needs of the learner matching the curriculum

Catering for the basic learners by giving immediate and relevant access to the knowledge is a multi-step process. The first step is the collection of all basic material namely concepts, exercises, definitions, examples etc. and store them in the knowledge base. Additional material can be collected from various sources

like the previous years archives (if available) of all questions including frequently asked questions and answers for them from various sources like newsgroups, discussion forums and mailing list etc. This archive can be used to compile a knowledge base and updated based on the new questions from the current students. Student profile parameters are also collected including extent of learning required, existing level of expertise, key interest, etc. The second step is to organize and transcribe the collected information in the knowledge base. The third step is to create a context-based search technology, which would enable the system for easy retrieval and to provide quick and accurate information to the learner. The search mechanism should allow the students to search by topic or index or by keyword as in common software help systems. The fourth step is the integration of user profile and knowledge base to give the best possible contextual resources related the search query. The fifth and final step is to create a user-friendly and intuitive interface for students to explore the knowledge content and ask queries.

Part 2: Catering for the advanced learner

Catering to advance learners requires quick acquisition, integration and presentation of relevant and correct knowledge from within the knowledge base and from websites distributed on the Internet and related to the context of the learner. The major concern in this process is the explosive growth of information, which lacks any quality checks, and integration of such information to make it useful knowledge in the context of learner's learning process. This requires meticulous evaluation of material available on the Internet and compiling and organizing the material to suit individual learning. Links to such evaluated material is maintained in the knowledge base for future use. This directory of these links is updated on a frequent basis. The rest of the steps involved in this part of the system are very similar to the first part and include information collection, evaluation for quality and authenticity, organization, creating proper retrieval mechanisms, integration of user profile and knowledge base and finally creation of user interface.

Figure 1 explains the processes involved in knowledge management systems in Internet based learning.

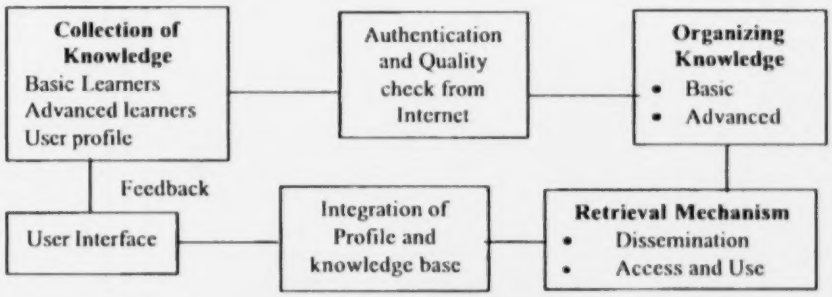

Figure 1: Knowledge Management Systems' Architecture

The results provided from the knowledge management system to any specific query are precise and concise. In other words students do not have to filter through abundance of information. Instead the knowledge management system does the job of sifting through the available information and gives appropriate and precise query results based on user profile.

6. Prototype

Based on the architecture, a prototype system is being developed which aims to guide the learners a guided discovery learning process. The guidance is individualized, based on the behavioural attributes of the learner. The components of the prototype are knowledge base, user profile database, knowledge engine, inference engine and interface. Knowledge base contains locally available information, references to Internet based distributed information, and cache of frequently accessed information. User profile database refers to the attributes of the learner gathered through user modeling mechanisms. Knowledge engine helps in manipulating

the acquired information and effective indexing and storage. Inference engine enables retrieval of knowledge as per individual learner's attributes. Interface provide adaptive representation of the knowledge to the learner.

Figure 2 summarizes the sequence of actions as a result of the student's query and the mechanism used in the processes. Student's question on the interface triggers the following set of activities. Student identification is sent to the learner profile database and the details are integrated with the student query. The modified query is sent to the inference engine. The engine attempts to retrieve the information from the local knowledge database. If the context related information is not available, it fetches it from distributed Internet websites. The newly acquired information is then integrated with the existing information and converted into contextual knowledge before presenting it on the interface to the student.

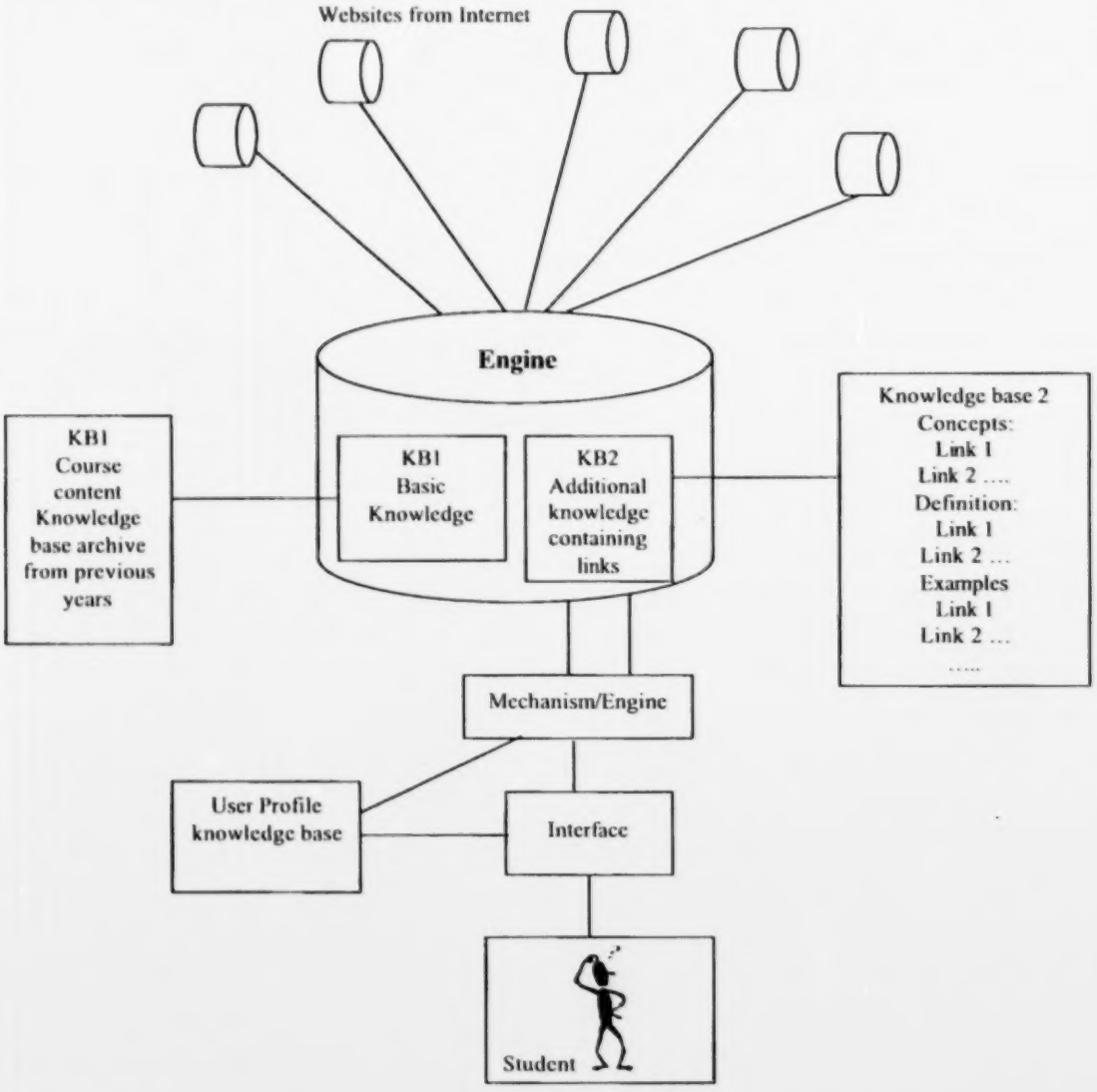

Figure 2: Student query and knowledge retrieval process

7. Conclusion

Knowledge management systems combined with Internet based learning have a lot to offer to the teaching and learning community. They can save the precious time for both teachers and students through immediate retrieval of knowledge and information. This paper described the rationale behind the development of such a system and provided the details of functionality being developed in a prototype.

Even if the course material is structured very well, there is still a value addition to a system like this for a simple reason, that in distant education, students learning takes place in different points in time and such a system can provide right kind of material at right time, while still taking advantage of the information available on the Internet, and individualized it to a particular learner's needs. As the Internet grows, the strategic impact of knowledge management in Internet based system will be greatly felt. There is bright, exciting future for this area of research and knowledge management will play an important role in its evolution and integration.

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